

THE CEDARS CONSERVATION PLAN

Sonoma County, California



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Acknowledgement

This Plan and the current focus on conserving The Cedars would not have occurred without the tireless efforts of Roger Raiche and David McCrory. Roger, a recognized expert botanist and former supervisor of the California Native Plant Collection at the UC Berkeley Botanical Gardens, has been investigating the botanical treasures of The Cedars for the better part of two decades and has led dozens of field trips in an effort to educate conservation organizations about the area's unique landscape, geology, and plants. His extensive exploration and botanical collection of plant specimens from throughout The Cedars Conservation Region has resulted in the documentation of species previously not known from Sonoma County, new plant varieties, and species previously unknown to science – The Cedars fairy lantern (*Calochortus raichei*) and The Cedars buckwheat (*Eriogonum cedrorum*). Roger maintains a botanical database for The Cedars that incorporates both his own detailed observations and lists by other botanists. This botanical work was instrumental in informing the Bureau of Land Management of the unique values on their land holdings in The Cedars, leading to designation of the 1,500-acre Area of Critical Environmental Concern.

As an independent conservation effort to protect the fragile ecosystem of the serpentine canyon, Roger and David purchased a 520-acre parcel in The Cedars in 1999. They are well-known for their hospitality and have made the property available to researchers and natural history enthusiasts interested in learning about The Cedars. Future conservation efforts will always remain indebted to the long history of Roger and David's documentation and promotion of the special values of the area, and their continuing acknowledgement that "The Cedars is a bigger thing than us as individuals."

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Cover photo: View of "Red Slide" in the Core Serpentine Zone of The Cedars taken from the northwest portion of Austin Creek State Recreation Area. Photo by Amy Chesnut.

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I. INTRODUCTION

The Cedars. An odd name for what is arguably the most extraordinary natural resource occurrence here in Sonoma County, California. The Cedars refers to an 11-square-mile land mass created by an extremely rare geological event which transpired over millions of years of tectonic activity. It is one of only several regions of its kind known to exist on the entire planet – and it is located just north of the quiet town of Cazadero in the Austin Creek watershed (Attachment 1). Its name, The Cedars, is a botanical misnomer as there are no true cedars (genus *Cedrus*) occurring there, but whoever first applied the name was obviously referring to Sargent cypress (*Cupressus sargentii*) which dominate much of the landscape. It is still unknown when the name first appeared on a map, and local residents of Cazadero do not use the name, preferring an older name, Red Slide, which does occur on 19th century maps of the County. Current research leads us to believe that the first map use of the name occurred in the early 1940s, when the area was remapped by the U.S. Geological Survey.

The rare geologic features of The Cedars were formed when the earth's mantle (normally about 3 to 70 miles beneath the surface) pushed through the earth's crust and exposed a massive area of peridotite. The bold rock protrusions are a vivid and sharp contrast to western Sonoma County's more typical landscape of rolling grassland hills, oak woodlands, and redwood/Douglas fir forest. Extensive weathering of the exposed peridotite rock, which is high in magnesium and iron concentrations, has led to the creation of serpentine¹ soils. The abundance of these specialized soils, tolerated only by a guild of specially-adapted plants, is the primary reason why The Cedars is home to dozens of endemic², rare, sensitive, and disjunct³ plant species. At least eight plant species have been found nowhere else in the world.



Serpentine canyon in The Cedars. Photo by Stephen Joseph.

The uniqueness of The Cedars has lured scientists of varying disciplines from around the world to study its rare attributes – botanical, geological, microbial, and entomological. Serpentine soils typically support rich biodiversity and occurrences of rare species. While there is much yet to learn from the exceptional geo-ecological characteristics of the area, researchers have lauded the

¹ The term “serpentine” is often applied in a general sense to all ultramafic rocks [such as peridotite], soils developed from them, and plants growing on them. Earl B Alexander, et al., *Serpentine Geocology of Western North America: Geology, Soils and Vegetation*, New York: Oxford University Press, 2007, 3.

² The term “endemic” refers to species that are completely restricted to one geographic area or to one specific habitat type.

³ “Disjuncts” are plants that occur elsewhere, but are separated from The Cedars by dozens or even hundreds of miles. Such isolation contributes to the development of unique varieties.

area's unrivaled resources. "No other single serpentine site can match The Cedars for its importance to the study and conservation of the Californian serpentine flora."⁴

In recognition of the exceptional natural resources of this area, public and private conservation organizations are working to permanently protect The Cedars and to create an ecological preserve to provide opportunities for scientific research, educational outreach and appropriate public access. With financial support from the California State Coastal Conservancy, and combined efforts of many partners via meetings, research, data analysis, field visits, and GIS mapping; *The Cedars Conservation Plan* was developed – a planning tool designed to focus efforts to protect The Cedars and linked habitats.



View over The Cedars Canyon into the Ecological Transition Zone. Photo by Stephen Joseph.

As a result of these planning efforts, the 35,000-acre Cedars Conservation Region has been defined which encompasses two important areas – the Core Serpentine Zone and the Ecological Transition Zone. The Core Serpentine Zone is in the center of the Conservation Region, and is readily recognized by its striking serpentine rock barrens, dotted with wildflowers, scrub, springs and scattered Sargent cypress woodlands. The Ecological Transition Zone surrounds the Core Serpentine Zone and supports a matrix of redwood-Douglas fir forest, mixed evergreen woodland, and coast live oak savannah, with isolated patches of serpentine outcrops, serpentine and non-serpentine chaparral, and old Sargent cypress woodlands.

⁴ Dr. Susan Harrison, Professor of Environmental Science and Policy at University of California, Davis. Letter. October 5, 2006. See Attachment 10.

II. OBJECTIVE OF THE CEDARS CONSERVATION PLAN

The objective of *The Cedars Conservation Plan* is to define The Cedars Conservation Region and guide conservation efforts and landowner education within the Region. Much of the area is in private ownership and, as evidenced by the superb condition of the natural resources in the area, the landowners are exemplary stewards of the land. *The Cedars Conservation Plan* is designed to facilitate voluntary land acquisition, conservation easements, and collaborative relationships with landowners and other interested partners within The Cedars Conservation Region. A specific list of parcels located within the Region was prepared as part of this Plan and will be used for internal planning purposes only. The methodology of how the Plan was prepared is described in Section IV.

III. VISION FOR THE CEDARS CONSERVATION REGION

Ecological Preserve

The collective vision for the Cedars Conservation Region is to create an intact, diverse ecological preserve which encompasses the unique geological and biological features in the Core Serpentine Zone and the Ecological Transition Zone (Attachment 2). The preserve is designed to protect rare serpentine and ecologically-linked habitats; provide opportunities for scientific research (both on conventional ecological systems, as well as the unique microbial communities that are subsisting at the extreme chemical limits of life), provide educational outreach and appropriate public access; and conserve long-established corridors for wildlife movement and floristic gene-pool connectivity – integrating and expanding upon benefits already provided by existing protected properties within the region managed by the California Department of Parks and Recreation, the Bureau of Land Management, and the Sonoma Land Trust. The preserve will consist of a combination of fee lands and conservation easements acquired voluntarily from willing sellers. The Sonoma Land Trust and its partners will work with the landowners in the Region to protect as much of the Conservation Region as possible. Some landowners in the Region may not be interested in participating in conservation transactions. To those, outreach efforts will be made regarding the unique qualities of the Region and they will be encouraged to participate in the protection of the Region by implementing management practices that will benefit the Region's natural resources. Funding for the acquisitions will be sought from public agencies and private sources, and efforts will be made to educate landowners about the financial benefits of donating interests in land to charitable organizations and government agencies.

“...with the Cedars, California possesses a rare gem of nature, which needs to be preserved and secured for future generations...We [Delft University of Technology] hope that California will value the uniqueness of the Cedars as a beautiful addition to the spectrum of its natural sanctuaries...”

- Professor J. Gijs Kuenen.
Department of General and Applied Microbiology, Delft University of Technology.

Recreational Use – Connectivity

Due to the fragile nature of talus and other steep-sloped areas, it is vital to minimize disturbance, while developing and maintaining limited access within the Cedars Conservation Region. Since the landscape is in a process of active serpentinization, it is imperative to preserve not only the geologic features, but also the chemical processes of serpentine soil formation and mineralization from the springs of the region.

A program of focused, controlled and limited public access will be fostered to provide opportunities for members of the public and other interested groups to experience the Cedars Conservation Region, while ensuring protection of the fragile natural resources. Regularly scheduled hikes will be provided by Sonoma Land Trust and other experienced partner organizations interested in providing public access. This strategy of limited access will encourage education and scientific research and will heighten the public's understanding of the unique ecology of The Cedars. As with all of its preserves, Sonoma Land Trust will continue to explore and develop opportunities to involve the public in ongoing stewardship, monitoring and restoration activities.

Creating a trail connection between Austin Creek State Recreational Area and Sonoma Coast State Park is a long-term, countywide goal. In the future, locating a portion of that trail system through non-sensitive areas of The Cedars Conservation Region may be considered. However, the primary purpose of the preserve is to protect fragile ecosystems and any access to and use of The Region will be considered in light of the overarching goal of protecting its unique biological and geological features.

Management Planning – Advisory Committee

Once the preserve is established, the Sonoma Land Trust and its partners will establish an Advisory Committee. This group will provide expertise and input for management and stewardship plans, as well as operations of the preserve. The guiding principle for the committee will be to develop strategies that will maximize retention of habitat values and ecological connectivity, while allowing for research, education and compatible recreational use. Members of the advisory committee will represent various disciplines – science, conservation, education, planning, public agency partners, recreationalists, and natural resource specialists. Any management plan will include a monitoring component to ensure on-going analyses and the ability to adapt to changing conditions, including climate change.

IV. DEVELOPMENT OF THE CEDARS CONSERVATION PLAN

In 2006, the Sonoma Land Trust began working with Roger Raiche and David McCrory to stimulate additional interest among conservation organizations to protect The Cedars. In 2007, the Coastal Conservancy provided a grant to the Sonoma Land Trust to develop a conservation plan and parcel study for the Region; conduct outreach to landowners identified in the Plan; and acquire core parcels. Since then, the Sonoma Land Trust has purchased a 40-acre parcel, cultivated relationships with several of the property owners in The Cedars, and encouraged meetings between landowners, public agencies, botanists, geologists, scientists and other private conservation partners to create a strategic and sensitive conservation plan for The Region. *The Cedars Conservation Plan* was developed through analysis of public plans, studies, and databases; GIS data and mapping technology; field trips; botanical and geological research; partner meetings; and regional landowner outreach. These processes are summarized below.

A. Study Area Reconnaissance and Review of Plans and Studies

The Cedars Conservation Plan attempts to make sense of a very diverse and rugged physical landscape. Sonoma Land Trust staff spent time and effort “learning” the land, meeting and talking with residents and landowners, and studying the existing plans, studies, databases, policies, and other written materials pertinent to this analysis. A list of the resources used for this plan is included in Section VII. The protection of The Cedars furthers the goals and objectives of 10 local, state, regional and federal plans related to natural resource, fish and wildlife protection; serpentine geoecology; recreation; and

watershed management. The entire list of plans with the applicable excerpted goals and objectives is attached as Attachment 9.

B. Partner Meetings and Field Trips

The Sonoma Land Trust staff facilitated site visits and agency meetings to determine the significant natural resource values in The Cedars; to identify the objectives of the partners; and to facilitate inter-agency communication. Raiche and McCrory hosted a number of site visits to their 520-acre property in the Core Serpentine Zone, and Orion Johnson, a geobiology graduate student in the University of Southern California's Department of Earth Science, has donated much of his time to educate the agency partners about his on-going microbial research. Other consulting partners include, California State Coastal Conservancy; Sonoma County Agricultural Preservation and Open Space District; California Department of Fish and Game; Bureau of Land Management; California Department of Parks and Recreation; and the California Native Plant Society. Other organizations and supporters of the conservation of The Cedars include, United States Fish & Wildlife Service; Stanford University; University of California at Davis; University of Southern California; and Delft University of Technology in the Netherlands.

C. Threats to The Cedars Conservation Region.

The remote location of The Cedars Conservation Region once made it seem safe from the land uses which threaten the large landscapes of Sonoma County. This remoteness, however, no longer provides reliable protection. As the populations of the Bay Area and Sonoma County increase, the loss of wildland habitat to rural residential development and agricultural (vineyard) conversions within Sonoma County is increasing at an alarming rate. It is well understood that land fragmentation into small parcels and its associated exurban uses compromise the ecological integrity of a landscape. This is especially so in an area as fragile as The Cedars, where the habitats need long periods of time to develop and/or recover due to the extreme ecological conditions. If The Cedars is not formally protected, it will simply be a matter of time before the area becomes more widely recognized as a desirable destination, and activities related to rural residential uses and agricultural pursuits will increase and compromise the integrity of the entire Cedars Conservation Region.

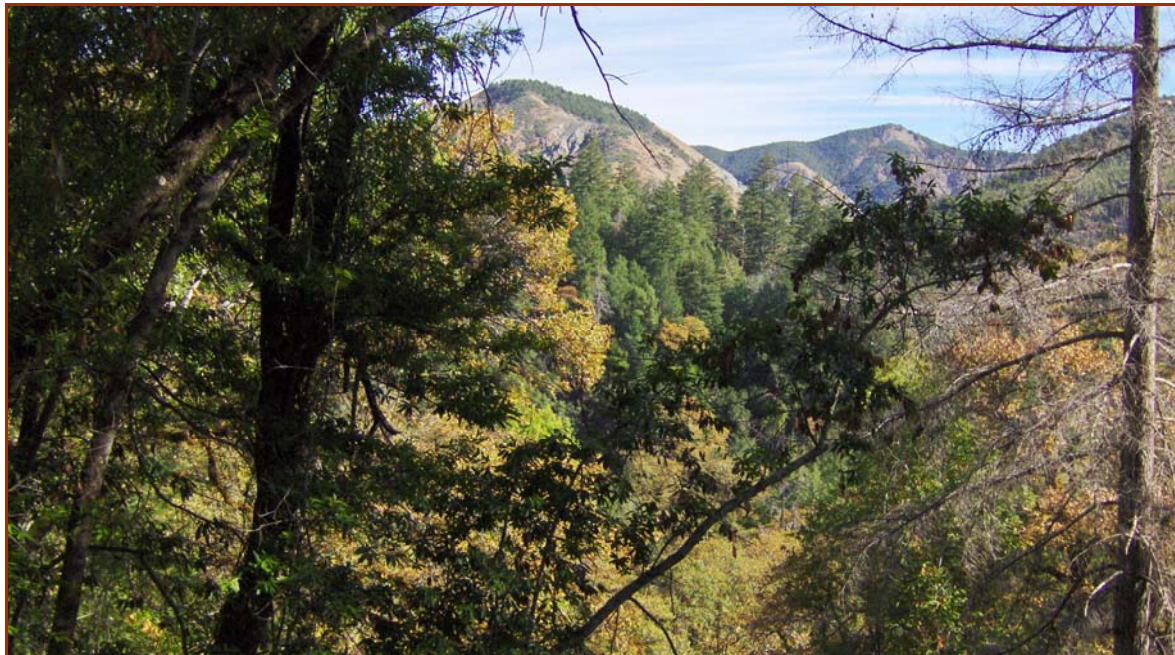
D. Determination of Region Boundary and Parcel Analysis

The location of the boundary of The Cedars Conservation Region was first determined from information provided by agency partner staff, database resources, natural resource experts, plans, studies, and individual landowners. The criteria used for this analysis included natural resource and habitat values, soil and vegetation types, and the presence of special status and endemic species. During this process, it became clear that the Region needed to include not only the Core Serpentine Zone (CSZ) – noticeably unique in its striking serpentine geological formations - but also a second, equally important zone – the Ecological Transition Zone (ETZ) surrounding the core serpentine habitats (Attachment 2). Therefore, *all* of the properties identified within The Cedars Conservation Region are important to the protection of priority watersheds and streams; survival of endemic and rare species; continued research of unusual soils, springs and microbial communities; and the overall preservation of the ecological integrity and biodiversity of The Cedars.

The Core Serpentine Zone (CSZ) represents our best attempt at defining an area that encompasses the 13 primary habitat types that have evolved with the highly unusual chemical composition of the rocks

and soils present in The Cedars as described by Roger Raiche. (See Attachment 7) Surrounding the CSZ, the Ecological Transition Zone (ETZ) supports a matrix of redwood-Douglas fir forest, mixed evergreen woodland, and coast live oak savannah, with isolated patches of serpentine outcrops, serpentine and non-serpentine chaparral, and old Sargent cypress woodlands. The ETZ encompasses all of the watershed lands that drain to the CSZ and its protection is essential to maintaining the important ecological processes and biological interactions that occur between the CSZ and the surrounding matrix.

The Cedars Conservation Region, which includes the CSZ and ETZ, is generally bounded by Stewarts Point-Skaggs Springs Road to the north, Armstrong Redwoods State Natural Reserve to the southeast and by King Ridge Road to the south and west. Once the boundary line of The Cedars Conservation Region was determined, the line was laid over a map with the Assessor's Parcel Data and the parcels located within the boundary lines were identified for conservation.⁵ *The Cedars Conservation Plan* is intended to be used as an internal guiding document for the Sonoma Land Trust and partners. The parcel data report prepared as part of this Plan will be used for internal planning purposes only, and will not be included as part of the printed version of this Plan.



View from Sonoma Land Trust's property toward the Core Serpentine Zone. Photo by Amy Chesnut.

⁵ The technical data sources used to produce *The Cedars Conservation Plan* and maps include aerial imagery from Digital Globe 2007; parcel/property ownership data from the County of Sonoma Enterprise GIS Database, July 2007 and SLT's RealQuest subscription; Gualala River Watershed data was extracted from CalWater version 2.2 (produced by the California Department of Fish and Game, 2001); Russian River Watershed data was gathered from GIS Data (produced by the National Marine Fisheries Service and Circuit Rider Productions, Inc.); species data was collected and compiled from the California Department of Fish and Game California Natural Diversity Database and the Austin Creek Watershed Assessment, 2005.

E. Landowner Outreach

During development of the Plan, the Sonoma Land Trust staff began to contact landowners to determine their interest in protecting their properties through fee acquisition or conservation easements. The Sonoma Land Trust acquired a key 40-acre parcel in December of 2007 (the Gay Property), and is currently engaged in negotiations with several landowners in the Region. The Land Trust will strategically initiate contact with all parcel owners identified in the Conservation Region, and/or work with its partners to assist with acquisition. For those landowners who do not wish to sell or donate interests in their land, we will seek to include them in the protection efforts through education about the unique qualities of the area and management practices that will benefit the region's natural resources. Funding for the acquisitions will be sought from the supporting partners, private organizations and donors, and efforts will be made to educate landowners about the financial benefits of donating interests in land to charitable organizations and government agencies. Private funding and public cost-share program funding will be sought for the operations and stewardship of The Cedars preserve.

V. DESCRIPTION OF THE CEDARS CONSERVATION REGION

A. Historical Land Use

Prior to European settlement, the Kashaya were the first people known to have lived in the area. While not much is known about their specific presence in The Cedars area, the "People From the Top of the Land", occupied lands extending from about thirty miles from the Gualala River in the north to Duncan's Point, a few miles south of the Russian River. West to east the Kashaya territory reached from the Pacific coastline to Dry Creek, about thirty miles inland. The population of pre-contact Kashaya is estimated to have included 1,500 persons living in large villages over different environmental zones within their territory.⁶ In 1812, the Russians arrived and negotiated with the Kashaya for the use of a parcel of land on the Coast – Fort Ross. Fort Ross remained until 1841, and following the departure of the Russians, Mexican and American settlers arrived. As the land became private property, The Kashaya could no longer travel freely over the landscape. From the 1870s, the Kashaya lived mainly in two villages located about five miles inland from Stewarts Point.⁷

The area of Cazadero was originally a hunting resort called "Ingrams" founded by Silas Deras Ingram in 1869, and was officially recognized as a town in 1881. George Simpson Montgomery, a wealthy businessman from San Francisco, purchased the town in January 1888 and changed its name to "Cazadero" (Spanish for "The Hunting Place"). The highly variable topography of the area may have deterred, but did not stop, its use by settlers for a variety of enterprises over time, including ranching, logging, and mineral extraction.⁸

One of the most economically significant minerals found within The Cedar's canyon walls is chromite. Wartime demands for chromium during World Wars I and II stimulated the mining of chromite in The Cedars between 1916 and 1920, and then again in 1942-1943. The remnants of the Laton (or Layton)

⁶ Otis Parrish, "The First People", excerpted from *Fort Ross*, Fort Ross Interpretive Association, 2001, <http://www.fortrossstatepark.org/firstpeople.htm>.

⁷ Ibid.

⁸ For additional information on the families who homesteaded the Cedars, see adventurer Leona Dixon Cox's account of homesteading 640 acres of mountainous land in Danfield Creek with her ailing father during the Great Depression in *Single Woman Homesteader*, published in 2000.

Mine are located in the main canyon of The Cedars. In addition to chromite, there was also some mining of magnesite in the headwaters area of East Austin Creek.⁹

B. Land Ownership

The Cedars Conservation Region is comprised of approximately 35,000 acres. About 20% of the Region is owned by public agencies and in permanent protection, with the remaining 80% in privately-owned parcels ranging in size from 40 to 700 acres. Current land use in the Region is rural residential with grazing, timber, hunting and other recreational uses. Zoning for most of the region is Resources and Rural Development (RRD), with scattered Timberland Production District (TP) and Public Facilities District (PF) parcels in the southeast, and Resources and Rural Development - Agricultural Preserve District (RRDWA) in the north and northwestern portions the Conservation Region. The Core Serpentine Zone encompasses approximately 9,338 acres and the Ecological Transition Zone consists of approximately 25,645 acres. At the heart of the Core Serpentine Zone is a 1,500-acre tract owned and protected as an Area of Critical Environmental Concern by the Bureau of Land Management (BLM).¹⁰ These BLM lands represent the largest roadless expanse in the Core Serpentine Zone, and are the geographic foundation for conservation efforts in the CSZ. The Sonoma Land Trust recently expanded protection by purchasing 40 acres located immediately adjacent to the largest tract of the BLM lands. The southerly portion of the Conservation Region encompasses about 4,815 acres of the 5,683-acre Austin Creek State Recreational Area and 75 acres of the 805-acre Armstrong Redwoods State Natural Reserve.¹¹

C. Geological Attributes

The Cedars Conservation Region is located within the Coast Range Geomorphic Province of northern California. The province is generally characterized as a series of northwest trending elongated ridges and valleys that are a result of folding and faulting, and includes many separate ranges, coalescing mountain masses, and several major structural valleys. The regional structure of the Coast Range is considered to be a number of independent fault blocks with different stratigraphic and structural histories (Attachment 5).¹²

In the midst of these elongated ridges and valleys that run in a general northwest direction lies the visually astounding Core Serpentine Zone, with its enormous barrens and talus slopes, many over 1000' feet high. Subduction of oceanic plates and subsequent mountain uplift led to the formation of these geologic characteristics¹³. Over millions of years, a block of the mantle rock called peridotite, (a layer normally between 3 and 70 miles or more below the surface) pushed up through the planet's crust to heights of 2,200 feet above sea level. While small, isolated blocks of peridotite are found at many sites in California and Washington, the Cedars peridotite exposure is massive, covering hundreds of acres. The Cedars peridotite is also geologically young and very active. As Dr. Kenneth Nealson, Fellow of

⁹ California Department of Natural Resources, Dow, D.H. and T.P. Thayer, *Geological Investigation of Chromite in California: Part II – Coast Ranges*, Bulletin 134, 1946, 6, 7 and 26.

¹⁰ The Cedars ACEC includes all BLM managed lands in the area identified on the Cazadero U.S. Geological Survey Quadrangle as “The Cedars” in the upper reaches of the Austin Creek Drainage. Description of “The Cedars of Sonoma County” ACEC boundary can be found in the U.S. Department of the Interior, Bureau of Land Management, *Ukiah Resource Management Plan*, September 2006.

¹¹ Austin Creek State Recreational Area, Map. California Department of Parks and Recreation, Armstrong Redwoods: 1998.

¹² California Division of Mines and Geology, Bailey, Edgar H., ed. *Geology of Northern California*. San Francisco: California Division of Mines and Geology Bulletin 190, 1966.

¹³ Alexander et al., 16.

the American Academy of Microbiology and the Wrigley Professor of Geobiology at USC explains, “processes that have long since terminated in other sites are presently active at The Cedars site, exhibiting many different manifestations of the peridotite/water interaction that can be studied in real time.”¹⁴ There are very few places on Earth where this set of conditions has intersected, and the area’s accessibility, relative to other locations under the sea or in the arctic region, make this an ideal locus for research and exploration.

D. Botanical Resources

The geographic isolation and varied landscape of The Cedars, with its dramatic talus barrens, rock outcrops, ecologically-challenging serpentine soils, mineral springs, and perennial watercourses support an amazing number of endemic, rare, and disjunct plant species. Please see Attachment 7 for a list of habitat types, plant species, and other data related to the plants’ endemism, speciation, type locality and special status prepared by Roger Raiche.

Core Serpentine Zone (CSZ)

The unusual chemical make-up of the rocks and soils in the Core Serpentine Zone has dramatic effects on vegetation and a very distinctive suite of plants with specialized adaptations occupy The Cedars.¹⁵ The chemical composition of serpentine soils is inimical to the growth of most plants due to the lack of or unfavorable ratio of essential plant nutrients and the presence of toxic elements. Plants that can tolerate serpentine soils, however, can thrive without competition from the dominant or invasive species that would otherwise be present.

“[I] cannot think of any other site I would consider more essential to conserve in its present pristine state for the sake of its outstanding contribution to California’s flora.”

-Professor Susan Harrison,
Department of Environmental
Science and Policy, UC Davis

An abundance of habitat niches occur at The Cedars due to the region’s diverse geological morphology, the presence or absence of moisture in different areas, and the serpentine rock and soil - high in magnesium, chromium and nickel; and low in calcium, nitrogen, potassium and phosphorus. Within the Core Serpentine Zone (CSZ), thirteen primary habitats types have been identified, ranging from a more vegetated cypress dominated mixed evergreen woodland to less vegetated talus barrens, and carbonate formations. The Sargent cypress (*Cupressus sargentii*), endemic to the Coast Ranges, occupies nearly every habitat within the CSZ and varies greatly in character - from near record size ancient specimens along the creek beds to 18” tall stunted “pygmy forests” and bonsai-like dwarfs on the upper barrens. Much of the understory in the CSZ is chaparral, dominated by leather oak (*Quercus durata*), sticky manzanita (*Arctostaphylos viscida* ssp. *puichella*), the endemic Cedar’s manzanita (*Arctostaphylos bakeri* spp. *sublaevis*), an undescribed species of creambush (*Holodiscus* sp.), and other chaparral plants. The herbaceous understory of the cypress woodland and chaparral supports a few of The Cedars' endemics - The Cedars fairy-lantern (*Calochortus raichei*), serpentine fleabane (*Erigeron serpentinus*), Freed’s jewelflower (*Streptanthus brachiatus* ssp. *hoffmannii*),



The Cedars fairy-lantern
Photo by Roger Raiche.

¹⁴ Nealson, Kenneth. Fellow, American Academy of Microbiology and Professor of Geobiology at University of Southern California. Letter. September 30, 2006.

¹⁵ Alexander et al., 160-167.

Morrison's jewelflower (*Streptanthus morrisonii* spp. *morrisonii*) and bearded jewelflower (*Streptanthus barbiger*); along with other more widespread plants. The drainages in The Cedars support western azalea (*Rhododendron occidentale*), hoary coffeeberry (*Rhamnus tomentella*), Brewer's willow (*Salix breweri*), California bay (*Umbellularia californica*), stream orchid (*Epipactis gigantea*), and many others. A massive slide in the southeast corner of the CSZ, "Red Slide" has been identified as one of the most species-rich areas in the entire Cedars Conservation Region.

Just beyond the core serpentine habitat lies a narrow strip of land known as the "contact zone"—a valuable ecotone between the contrasting soils and vegetation of serpentine and non-serpentine areas. Less than 100' wide in most areas, the contact zone contains a rich mix of species and some distinct habitats not found within the core serpentine areas. As Roger Raiche explains, "in a purely demographic sense, the transition areas represent the largest number of species, as serpentine and non-serpentine taxa mix back and forth on substrates of various compositions and blends."¹⁶



Sargent cypress woodland in the Core Serpentine Zone of The Cedars. Photo by Amy Chesnut.

Ecological Transition Zone (ETZ)

Surrounding the Core Serpentine Zone, lies the Ecological Transition Zone which supports a matrix of non-serpentine habitats including redwood-Douglas fir forest, mixed evergreen woodland, and coast live oak savannah, with isolated serpentine outcrops and patches of serpentine and non-serpentine chaparral and old Sargent cypress woodlands. The non-serpentine habitats within the ETZ serve as an important reference for the study of nearby serpentine areas in the CSZ and isolated patches of serpentine within the ETZ. Due to its diversity of soil types (primarily non-serpentine), the ETZ hosts a much more complete floristic representation of the region and by studying the ETZ's non-serpentine

¹⁶ Attachment 7: "Habitat and Plant Information" by Roger Raiche.

associated flora and fauna, scientists can compare serpentine and non-serpentine areas and gain a more complete understanding of what would grow in the serpentine areas if not for the serpentine soils.

Functionally, the ETZ serves as a critical biological buffer for the CSZ, helping to protect the rarer serpentine-associated plants in the CSZ from invasion and damage by non-native plants and animals. The ETZ also encompasses all of the watershed lands that drain to the CSZ and its protection is essential to maintaining the important ecological processes and biological interactions that occur between the CSZ and the surrounding matrix.

Finally, the ETZ provides access to some remote areas in the CSZ which does not have a self-contained road system to access most of the terrain. Protection of the ETZ could also allow for recreational use in the region, without damaging the most sensitive areas of the CSZ.

E. Fish & Wildlife

The fish and wildlife species that occur within the Cedars Conservation Region represent a wide range of taxonomic groups and a high degree of rarity within northern California. Such diversity is indicative of a healthy ecosystem with a high conservation value. Five species that are federally protected under the Endangered Species Act—Chinook (*Oncorhynchus tshawytscha*), steelhead (*Oncorhynchus mykiss*), coho salmon (*Oncorhynchus kisutch*), California freshwater shrimp (*Syncaris pacifica*), and northern spotted owl (*Strix occidentalis caurina*)—are likely to occur within the suitable habitats in the region.¹⁷ Steelhead has been found in the upper reaches of Azalea Creek, within the Conservation Region, and the California freshwater shrimp has been observed in East Austin Creek at the southern edge of the Conservation Region.¹⁸

The California Department of Fish and Game's Recovery Strategy for California Coho Salmon (2004) identifies The Cedars as a high priority conservation area due to the presence of the headwaters of Austin Creek, a coho salmon stream. In addition, Gray and Gilliam Creeks (tributaries of Austin Creek) are used by the multi-agency Russian River Coho Salmon Captive Broodstock Program.¹⁹

Known animal Species of Special Concern that occur within the Region include foothill yellow-legged frog (*Rana boylei*), Gualala roach (*Lavinia symmetricus parvipinnis*), and Sonoma tree vole (*Arborimus pomo*).²⁰ Foothill yellow-legged frogs have been recorded from locations in Upper and Lower Austin Creek. Much of the area is also suitable for ringtail (*Bassariscus astutus*), though formal documentation of this inadequately studied Species of Concern is not available. The habitat is suitable for supporting several Species of Concern, including American badger (*Taxidea taxus*), pallid bat (*Antrozous pallidus*), Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*Accipiter striatus*), Vaux's swift (*Chaetura vauxi*), yellow warbler (*Dendroica petechia*), and yellow-breasted chat (*Icteria virens*). While insufficient biological surveys are available to document the presence of these species, due to their occurrence in similar habitats of the county, most are likely to occur within The Cedars Conservation Region. See Attachment 8 for the

¹⁷ California Department of Fish and Game, *State and Federally Listed Endangered and Threatened Animals of California*, 2009.

¹⁸ Derek Acomb, California Department of Fish and Game. Personal Communication. 2008.

¹⁹ The agencies participating in the Russian River Coho Salmon Captive Broodstock Program are the U.S. Army Corps of Engineers, the National Oceanic and Atmospheric Administration, the California Department of Fish and Game, the University of California Cooperative Extension, the Sonoma County Water Agency, Trout Unlimited, the Institute for Fisheries Resources, California Sea Grant, and the Bodega Marine Lab.

²⁰ California Department of Fish and Game, *California Natural Diversity Database*.

California Natural Diversity Database (CNDDB) Lists for the Tombs Creek, Fort Ross, Cazadero, and Warm Springs Dam Quadrangles, each of which contain portions of The Cedars Conservation Region.

Known occurrences of common mammal species in the Conservation Region include black bear (*Ursus americana*), mountain lion (*Felis concolor*), bobcat (*Lynx rufus*), California mule deer (*Odocoileus hemionus*), black-tailed jackrabbit (*Lepus californicus*), as well as numerous rodent species. The occurrence of mountain lion, a key indicator species, suggests the presence of healthy populations of prey species such as deer and small mammals. The presence of black bear; a wide-ranging, large mammal that prefers a mix of remote habitats that include mature forest stands; supports the assessment of the area as a large block of quality habitat.

In addition to the amphibians discussed above, CDFG has reported observations of several reptiles and amphibians in the Region: northern alligator lizard (*Gerrhonotus coeruleus*), southern alligator lizard (*Elgaria multicarinata*), sagebrush lizard (*Sceloporus graciosus*), pacific treefrog (*Pseudacris regilla*) and California newt (*Taricha torosa*). These species occupy a range of habitats, from marshes and riparian corridors to hot dry slopes. Some require a variety of habitat types during different life history stages.

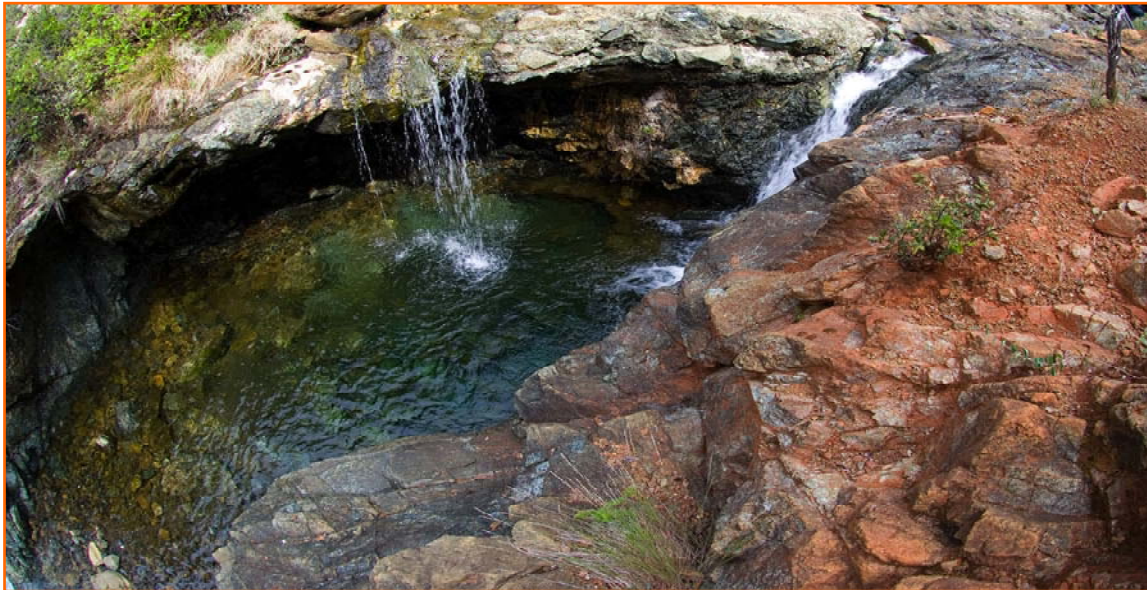
Finally, The Cedars also hosts a rare dragonfly - the black petaltail (*Tanypteryx bageni*). California Native Plant Society member Alan Wight first discovered the species at The Cedars in 2000. Since then, the black petaltail has only been documented at one other Sonoma County site (above the Mayacamas Audubon Preserve along Pine Flat Rd.).

F. Hydrology and Microbial Research

The Cedars Conservation Region is located primarily within the Austin Creek Watershed (Russian River Basin), with smaller portions located in the Wheatfield Fork of the Gualala River Watershed. The headwaters of Big Austin Creek, East Austin Creek (Russian River) and Danfield, Grasshopper and Cedar Creeks (Gualala River) are within the Region. These drainages are home to a high degree of biodiversity, including several threatened and endangered species. Austin Creek, as part of the Russian River watershed, is listed as impaired by fine sediment levels under section 303(d) of the Clean Water Act. Protection of headwaters in the Conservation Region is intended to contribute to the overall health of both of these major river systems in Sonoma County.

Microbial Research

Due to the on-going process of serpentinization that is occurring in the Core Serpentine Zone, the water chemistry in numerous seeps and springs at the Cedars is highly unusual. Water entering cracks in the rock reacts with the peridotite minerals to form a group of more stable secondary minerals. This process produces water of high alkalinity (pH 11-12) and causes the rapid formation of calcium carbonate micro-terraces during the dry season (June -Nov). These terraces are washed away during the rainy season. Scientists from around the world have come to observe and study these springs and have determined them to represent one of harshest natural environments on Earth for life. Nevertheless, life exists in these extreme alkaline environments and may be fundamentally different than most other lifeforms. In particular, microbial lifeforms have been discovered whose metabolic processes are fundamentally different from those of most other biota. Geochemical findings at The Cedars illustrate the existence of microbes that can thrive in hydrogen and methane-saturated ultrabasic solution; moreover, a suite of microbial-mineral attachments have been discovered at The Cedars that are unusually diverse and potentially different from any others currently known.



Austin Creek in The Cedars Canyon. Photo by Stephen Joseph.

On-going research is being conducted to understand the physiological and metabolic adaptations that allow microbial life to live in such extreme conditions.²¹ This research is likely to support an expansion of the scientific community's understanding of what factors limit microbial life on earth. Such knowledge may prove invaluable to such fields as wastewater treatment and natural resources management.²² It has also been noted that the diverse microbiological communities that occur within the spring waters of The Cedars are considered one of the best analogues for understanding the development of early life processes on Earth and other terrestrial bodies.²³ These irreplaceable hydrologic, microbial and geologic systems found at The Cedars have motivated a conservation ethic within the scientific community. Many researchers champion the protection of The Cedars and proclaim it to be a place of "outstanding significance", and a "unique and valuable national treasure" due to the "uniqueness of the life processes taking place" at the present time.²⁴

VI. CONCLUSION

The Cedars Conservation Plan is a collaborative vision and framework for the long-term protection of The Cedars and integrated habitats. The goal is to create an ecological preserve of The Cedars Conservation Region by forming an integrated network of fee lands, conservation easements and best management practices on privately-held lands. The planning process has allowed private, public and non-profit organizations and agencies to work in partnership and forge relations in the scientific and scholastic communities while furthering a conservation ethic in Sonoma County and beyond.

²¹ Orion Johnson, "The Cedars Peridotite: A geobiological mecca at an extreme interface between geology and biology," The Cedars Stakeholder Tour (Cazadero, CA), April 2007.

²² Gijs J. Kuenen, Professor of General and Applied Microbiology. Delft University of Technology. Letter. September 28, 2006.

²³ Robert G. Coleman, member of the National Academy of Science and a Professor of Geology at Stanford University. Letter. September 30, 2006.

²⁴ Please see Attachment 10 for researchers' letters. Scientists from around the world, including researchers from University of Southern California, Stanford, and Delft University in the Netherlands are studying the geologic and microbial processes taking place in the region.

The Cedars preserve will provide opportunities for key scientific research, educational outreach and public access for unique low intensity recreation. *The Cedars Conservation Plan* will be a guide to preserve fragile ecosystems within an extraordinary serpentine landscape and the species-rich transition habitats. Collectively, the conservation partners will work to develop management and stewardship plans, as well as manage the ongoing operations of the preserve areas. If we protect the properties listed in this Plan via conservation transactions and best management practices, we will ensure that The Cedars area will be available for future generations to study and enjoy.

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